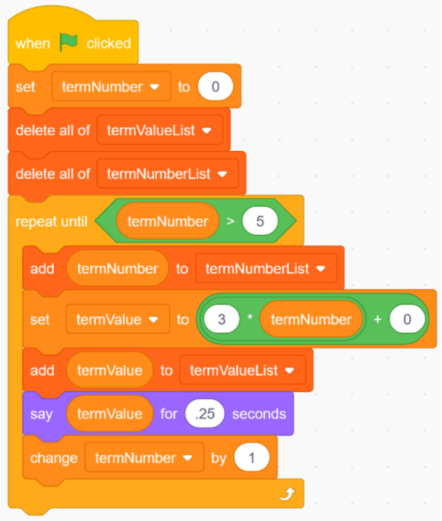
Name________________________________ Date_____________________

Algebra
Unit 3 Line Master 2a

Coding Algebraic Expressions to Generate Linear Growing Patterns

You will alter existing code to generate various linear growing patterns that are described using algebraic expressions.
To do this, you will alter the rate of change (multiplier) and initial values in the code.

Begin with the following application:
https://scratch.mit.edu/projects/795444171/editor/

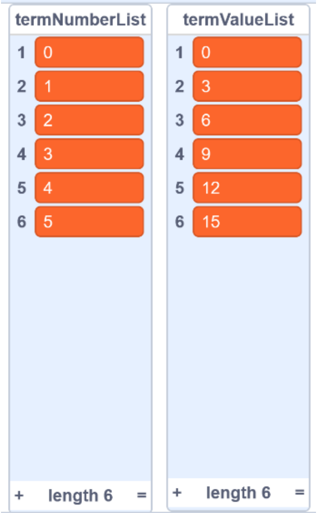


```
when ⚑ clicked
set termNumber ▾ to 0
delete all of termValueList ▾
delete all of termNumberList ▾
repeat until termNumber > 5
    add termNumber to termNumberList ▾
    set termValue ▾ to 3 * termNumber + 0
    add termValue to termValueList ▾
    say termValue for .25 seconds
    change termNumber ▾ by 1
```

If you have a Scratch login, save the project in your Scratch account by selecting **Remix** at the top of the screen.
A login is not required to work with the code, but you will not be able to save your changes without it.

Note: Like the first code you created, this code uses both variables and lists. In this code, **termNumber** and **termValue** are variables, while **termValueList** and **termNumberList** are lists.

1. Click on the **green flag** to execute the code. You will see that two lists are generated and displayed on the stage—one list called **termNumberList** that contains the term numbers and one list called **termValueList** that contains the term values.



	termNumberList		termValueList
1	0	1	0
2	1	2	3
3	2	3	6
4	3	4	9
5	4	5	12
6	5	6	15
+	length 6 =	+	length 6 =

Mathology 7, *Coding*

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Algebra
Unit 3 Line Master 2b

Coding Algebraic Expressions to Generate Linear Growing Patterns (cont'd)

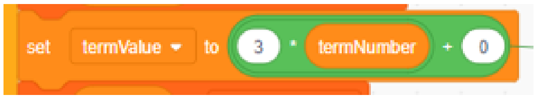
For term number 0, our term value is 0.
For term number 1, our term value is 3.
For term number 2, our term value is 6.
For term number 3, our term value is 9, and so on.

- What operation do we perform on the term number to get the term value?

Did you answer "multiply by 3?" That's correct!
If you aren't certain how we got this answer, look at the relationship between the two sets of data:

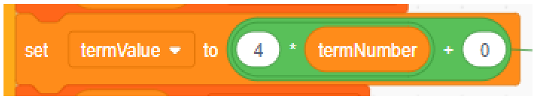
By what do you have to multiply 1 to get 3?
By what do you have to multiply 2 to get 6?
By what do you have to multiply 3 to get 9?

2. Let's take a closer look at the algebraic expression that is used to generate the term values in the code:



```
set termValue ▾ to 3 * termNumber + 0
```

The **termValue** variable is set to: **3 * termNumber + 0**
In coding, an "*" indicates *multiplication*, so this can be thought of as 3*x* + 0, where *x* is the **termNumber**.
a) In the code, alter the expression to the following:



```
set termValue ▾ to 4 * termNumber + 0
```

Before executing the code, predict what will be output in the two lists.
b) Click on the green flag to execute the code.
Was your prediction correct?

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Algebra
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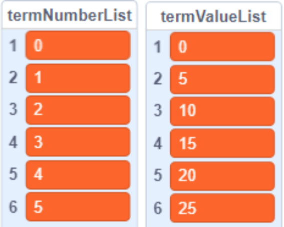
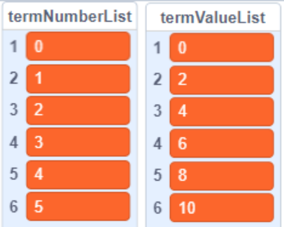
Coding Algebraic Expressions to Generate Linear Growing Patterns (cont'd)

3. Alter the expression in the code to generate each list of numbers. For each set of values, write down the expression you use to generate the term values. The first expression has been included for you.

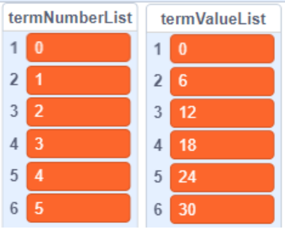
a) 5 * termNumber + 0 b) ______________ c) ______________



	termNumberList		termValueList
1	0	1	0
2	1	2	5
3	2	3	10
4	3	4	15
5	4	5	20
6	5	6	25



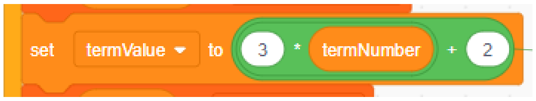
	termNumberList		termValueList
1	0	1	0
2	1	2	2
3	2	3	4
4	3	4	6
5	4	5	8
6	5	6	10



	termNumberList		termValueList
1	0	1	0
2	1	2	6
3	2	3	12
4	3	4	18
5	4	5	24
6	5	6	30

4. Now, let's alter the expression in the code to use an initial value of 2, so, that at **termNumber** 0, the **termValue** will start at 2. The new expression is: **3 * termNumber + 2**

a) Alter the Scratch code now to reflect this change:



```
set termValue to 3 * termNumber + 2
```

Before executing the code, predict what will be outputted in the lists.

b) Click on the green flag to execute the code.
Was your prediction correct?

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Algebra
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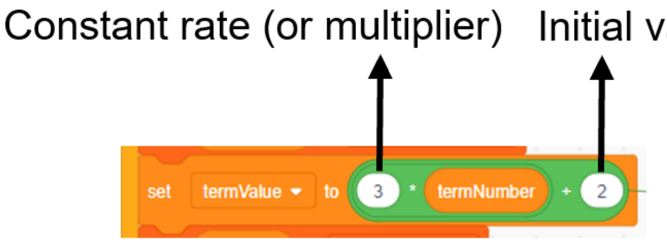
Coding Algebraic Expressions to Generate Linear Growing Patterns (cont'd)

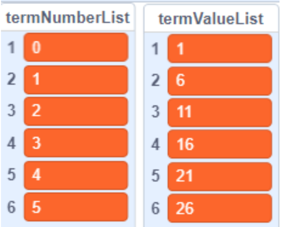
5. Alter the expression in the code to generate the lists of numbers below. For each set of values, write down the expression you use to generate the term numbers on the blank line.

Hint: The initial value is the value of term 0 and is listed as **termNumber** 0. The constant rate, or multiplier, is the amount by which the values in the **termValueList** are changing.



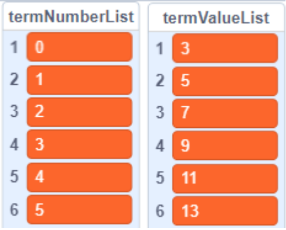
```
set termValue ▾ to 3 * termNumber + 2
```

a) _______________



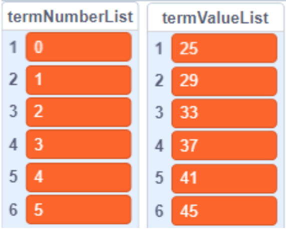
	termNumberList		termValueList
1	0	1	1
2	1	2	6
3	2	3	11
4	3	4	16
5	4	5	21
6	5	6	26

b) _______________



	termNumberList		termValueList
1	0	1	3
2	1	2	5
3	2	3	7
4	3	4	9
5	4	5	11
6	5	6	13

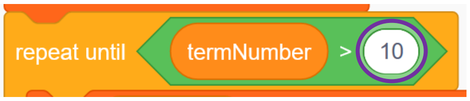
c) _______________



	termNumberList		termValueList
1	0	1	25
2	1	2	29
3	2	3	33
4	3	4	37
5	4	5	41
6	5	6	45

6. Change the expression back to: **3 * termNumber + 2**
Now, you'll alter the code so that you output the term numbers and values all the way to term number 10.

To do this, change the *defined count* in the repeat to **termNumber > 10**. This will ensure the term values will be output up to and including term number 10.



```
repeat until termNumber > 10
```

defined count: In coding, the number of times instructions are repeated**,** based on a predefined value or until a condition has been met.

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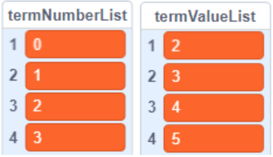
Coding Algebraic Expressions to Generate Linear Growing Patterns (cont'd)

7. Alter the expression and the defined count in the code to generate the following lists of numbers. For each set of values, write down the expression you use to generate the term values on the blank line. Write the number you use for the defined count as well.

a) _______________

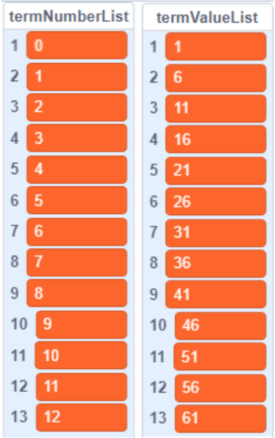
defined count: ______



	termNumberList		termValueList
1	0	1	2
2	1	2	3
3	2	3	4
4	3	4	5

b) _______________

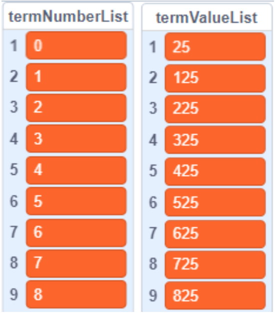
defined count: ______



	termNumberList		termValueList
1	0	1	1
2	1	2	6
3	2	3	11
4	3	4	16
5	4	5	21
6	5	6	26
7	6	7	31
8	7	8	36
9	8	9	41
10	9	10	46
11	10	11	51
12	11	12	56
13	12	13	61

c) _______________

defined count: ______



	termNumberList		termValueList
1	0	1	25
2	1	2	125
3	2	3	225
4	3	4	325
5	4	5	425
6	5	6	525
7	6	7	625
8	7	8	725
9	8	9	825

8. Finally, let's alter the code so that the **termNumber** variable increases by an amount other than 1. That is, we will alter the **change termNumber by 1** block.

Let's start with our original expression, **3 * termNumber + 2**, but output up to term number 100, increasing our **termNumber** by **10** each time. The altered code and output are shown on the next page.

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Algebra
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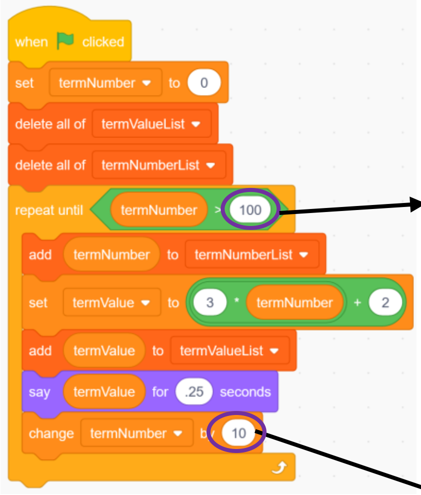
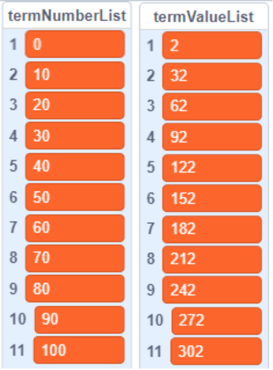
Coding Algebraic Expressions to Generate Linear Growing Patterns (cont'd)



```
when ⚑ clicked
set termNumber ▾ to 0
delete all of termValueList ▾
delete all of termNumberList ▾
repeat until termNumber > 100
    add termNumber to termNumberList ▾
    set termValue ▾ to 3 * termNumber + 2
    add termValue to termValueList ▾
    say termValue for .25 seconds
    change termNumber ▾ by 10
```

Change this number to 100.

Change this number from 1 to 10.

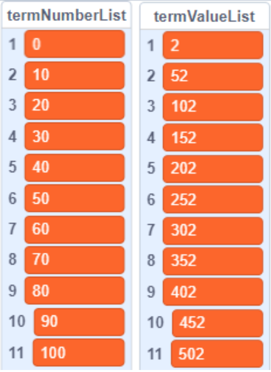


	termNumberList		termValueList
1	0	1	2
2	10	2	32
3	20	3	62
4	30	4	92
5	40	5	122
6	50	6	152
7	60	7	182
8	70	8	212
9	80	9	242
10	90	10	272
11	100	11	302

9. Alter the code to output the following lists of numbers.
For each set of values, write down the expression you use to generate the term values on the blank line.
What expression did you use in the repeat until block?
By what did you increase the termNumber variable each time?

a) ______________

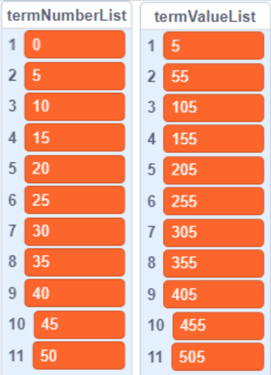
defined count: _____



	termNumberList		termValueList
1	0	1	2
2	10	2	52
3	20	3	102
4	30	4	152
5	40	5	202
6	50	6	252
7	60	7	302
8	70	8	352
9	80	9	402
10	90	10	452
11	100	11	502

b) ______________

defined count: _____



	termNumberList		termValueList
1	0	1	5
2	5	2	55
3	10	3	105
4	15	4	155
5	20	5	205
6	25	6	255
7	30	7	305
8	35	8	355
9	40	9	405
10	45	10	455
11	50	11	505